

CLAIMS:

The invention is claimed as follows:

1. A system for providing peritoneal dialysis to a patient, the system comprising:
 - 5 a catheter having an inflow lumen and an outflow lumen in communication with the patient's peritoneal cavity;
 - a fluid circuit in fluid communication with the catheter thereby defining a fluid loop capable of circulating a therapy fluid into, through and out of a peritoneal cavity of the patient;
 - 10 a supply of a dialysate coupled to the fluid circuit;
 - a cycler that pumps the dialysate into the fluid circuit at a feed rate and circulates the dialysate at a circulation rate along the fluid loop to remove a therapeutic effective amount of solutes and excess water from the patient; and
 - a discharge fluid path coupled to the fluid loop through which the
 - 15 therapy fluid is drained from the fluid circuit at a discharge rate that is less than the circulation rate allowing the therapy fluid to be circulated a plurality of times along the fluid loop prior to discharge.
2. The system of Claim 1 wherein the feed rate and the discharge rate are less than the circulation rate.
3. The system of Claim 2 wherein the feed rate and the discharge rate are maintained at an approximately equal rate that is about one half of the circulation rate allowing the dialysate to circulate about two times along the fluid loop.
- 25 4. The system of Claim 1 wherein the feed rate and the discharge rate are maintained at an approximately equal rate that is about one third of the circulation rate such that the dialysate is capable of circulating about three times along the fluid loop.
- 30 5. The system of Claim 1 wherein the circulation rate is about 300 ml/min or less.

6. The system of Claim 1 wherein the supply of dialysate contains about 25 liters or less of dialysate.

7. The system of Claim 1 wherein the dialysate is continuously fed, 5 circulated and drained over a treatment period of about 8 hours or less.

8. The system of Claim 1 wherein an initial volume of the dialysate is infused into the peritoneal cavity of the patient and an additional volume of the dialysate is subsequently and continuously fed into the fluid circuit during treatment.

10 9. The system of Claim 8 wherein the initial volume of the dialysate is circulated along the fluid loop during an initial treatment period without the continuous feed of the additional volume of the dialysate into the fluid loop and the continuous discharge of therapy fluid from the fluid loop.

15 10. The system of Claim 1 further comprising a chamber in fluid communication with the fluid loop such that the fluid loop can accommodate a variable increase in the therapy fluid during treatment.

20 11. The system of Claim 10 wherein the variable increase in therapy fluid is due to an addition of ultrafiltrate to the fluid loop as the dialysate dialyzes the patient.

12. The system of Claim 1 wherein the feed rate and the discharge rate are alternately varied to create tidal CFPD.

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13. A system for providing peritoneal dialysis to a patient, the system comprising:

a catheter having an inflow lumen and an outflow lumen in communication with the patient's peritoneal cavity;

5 a fluid circuit in fluid communication with the catheter thereby defining a fluid loop capable of circulating a therapy fluid into, through and out of a peritoneal cavity of the patient;

a supply of a dialysate;

10 a chamber coupled to the fluid loop through which the dialysate can be fed at a feed rate into the fluid loop;

a cycler that pumps the dialysate into the fluid loop and circulates the dialysate along the fluid loop at a circulation rate to remove a therapeutic effective amount of solutes and excess water from the patient; and

15 a discharge fluid path coupled to the fluid loop through which the therapy fluid is drained from the fluid circuit at a discharge rate effective to cause the therapy fluid to be circulated a plurality of times along the fluid loop prior to discharge.

14. The system of Claim 13 wherein the supply of dialysate contains about 20 25 liters or less of dialysate.

15. The system of Claim 14 wherein the dialysate is contained in four separate supply containers each having a capacity of about 6 liters or less.

25 16. The system of Claim 13 wherein the circulation rate is about 300 ml/min or less.

17. The system of Claim 13 wherein the chamber is capable of mixing and heating the dialysate.

30 18. The system of Claim 13 wherein the chamber is coupled to the fluid loop via a fluid supply path.

19. The system of Claim 18 wherein the feed rate and the discharge rate are maintained at an approximately equal rate that is less than the circulation rate such that the dialysate is capable of circulating the plurality of times along the fluid loop.

5 20. The system of Claim 13 wherein the chamber is directly coupled to the fluid loop.

10 21. The system of Claim 20 wherein the dialysate is circulated along the fluid loop a number of times that is approximately equal to the feed rate divided by a difference between the circulation rate and the discharge rate.

22. The system of Claim 13 wherein the dialysate is continuously fed into, circulated within and drained from the fluid loop over a treatment period of about 8 hours or less.

15 23. The system of Claim 13 wherein the chamber can be adapted to accommodate a variable increase in therapy fluid during treatment.

24. A system for providing peritoneal dialysis to a patient, the system comprising:

a catheter having an inflow lumen and outflow lumen in communication with the patient's peritoneal cavity;

5 a fluid circuit in fluid communication with the catheter thereby defining a fluid loop capable of circulating a therapy fluid into, through and out of the peritoneal cavity;

a supply of a dialysate coupled to the fluid loop;

10 a cycler that pumps the dialysate into the fluid loop at a feed rate and circulates the dialysate along the fluid loop at a circulation rate to remove a therapeutic effective amount of solutes and excess water from the patient;

a cleaning device coupled to the fluid loop via a cleaning fluid path wherein the therapy fluid including the dialysate can be fed into the cleaning fluid path and cleaned at a cleaning rate prior to reintroduction into the fluid loop; and

15 a discharge fluid path coupled to the fluid loop through which the therapy fluid is drained at a discharge rate effective to circulate the therapy fluid a plurality of times along the fluid loop prior to discharge.

25. The system of Claim 24 wherein the fluid loop is coupled to the supply 20 of dialysate, the cleaning fluid path and the discharge fluid path via a cycler.

26. The system of Claim 25 wherein the cycler includes a fluid circuit coupled to a pumping mechanism and a plurality of valves such that the cycler is capable of automatically controlling the flow of dialysate into and out the fluid loop 25 during treatment.

27. The system of Claim 24 wherein the cleaning device contains a sorbent material capable of non-selective removal of solutes from the dialysate prior to reuse.

30 28. The system of Claim 27 wherein the sorbent material is selected from the group consisting of carbon, activated charcoal and combinations thereof.

29. The system of Claim 24 wherein the supply of dialysate contains about 25 liters or less of dialysate.

30. The system of Claim 24 further comprising a chamber coupled to the 5 fluid loop that is capable of accommodating for a variable increase in therapy fluid volume during treatment.

31. A method of providing peritoneal dialysis to a patient, the method comprising the steps of:

10 coupling a fluid circuit in fluid communication to a catheter in a peritoneum of the patient thereby defining a fluid loop along which a therapy fluid is capable of being circulated into, through and out of the peritoneum;

supplying a source of dialysate to the fluid loop at supply rate;

15 circulating the therapy fluid including the dialysate along the fluid loop at a circulation rate to remove a therapeutic effective amount of excess water and solutes from the patient;

draining the fluid loop of the therapy fluid at a discharge rate; and

causing the dialysate to circulate a plurality of times along the fluid loop prior to discharge.

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32. The method of Claim 31 wherein the feed rate and the discharge rate are maintained at an approximately equal rate that is about one half of the circulation rate such that the therapy fluid is capable of circulating about two times along the fluid loop prior to discharge.

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33. The method of Claim 32 wherein the feed rate and the discharge rate are maintained at an approximately equal rate that is about one third of the circulation rate such that the dialysate is capable of circulating about three times along the fluid loop prior to discharge.

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34. The method of Claim 31 wherein the circulation rate is maintained at about 300 ml/min or less.

35. The method of Claim 31 wherein about 25 liters or less of the dialysate is continuously fed into the fluid loop during treatment.

36. The method of Claim 31 wherein the dialysate is continuously fed, 5 circulated and discharged over a treatment period of about 8 hours or less.

37. The method of Claim 31 further comprising the step of cleaning the therapy fluid including the dialysate prior to recirculation into, through and out of the peritoneum of the patient along the fluid loop to remove at least a portion of solutes 10 from the therapy fluid.

38. The method of Claim 37 wherein a sorbent material selected from the group consisting of carbon, activated charcoal and combinations thereof is used to non-selectively remove the solutes from the therapy fluid.

15 39. The method of Claim 31 further comprising the step of automatically controlling therapy fluid flow into and out of the fluid loop.

40. The method of Claim 39 further comprising the step of using a cycler to 20 automatically control therapy fluid flow into and out of the fluid loop wherein the cycler includes a pumping mechanism coupled to a series of fluid lines having a plurality of valves to regulate fluid flow into and out of the fluid loop.

41. The method of Claim 31 wherein the fluid loop can be adjusted to 25 accommodate for a variable increase in volume of the therapy fluid during treatment.

42. The method of Claim 41 wherein the variable increase is due to an addition of ultrafiltrate to the fluid loop as the therapy fluid dialyzes the patient.

30 43. The method of Claim 31 further comprising the steps of infusing an initial volume of the dialysate into the patient and adding an additional volume of the dialysate during treatment subsequent to the infusion of the initial volume of dialysate.

44. The method of Claim 43 wherein the initial volume of dialysate is circulated during an initial treatment period prior to adding the additional volume of dialysate and prior to discharging fluid from the fluid loop.

5 45. The method of Claim 31 wherein the feed rate and the discharge rate are alternatively varied to create tidal CFPD.

46. A method of providing peritoneal dialysis to a patient, the method comprising the steps of:

10 coupling a fluid circuit in fluid communication to a catheter in a peritoneum of the patient thereby defining a fluid loop along which a therapy fluid is capable of being circulated into, through and out of the peritoneum;

coupling a chamber to the fluid loop;

15 supplying a source of dialysate to the fluid loop through the chamber at a supply rate;

circulating the therapy fluid including the dialysate along the fluid loop at a circulation rate to remove a therapeutically effective amount of excess water and solutes from the patient; and

20 draining the fluid loop of the therapy fluid at a discharge rate effective to cause the dialysate to circulate a plurality of times along the fluid loop prior to discharge.

47. The method of Claim 46 wherein about 25 liters or less of dialysate is continuously fed into the fluid loop during peritoneal dialysis.

25 48. The method of Claim 46 wherein the dialysate is contained in four separate supply containers each having a capacity of about 6 liters or less.

49. The method of Claim 46 wherein the circulation rate is maintained at 30 about 300 ml/min or less.

50. The method of Claim 46 wherein the dialysate is mixed and heated as it passes through the chamber into the fluid loop.

51. The method of Claim 46 wherein the dialysate is fed from the chamber into the fluid circuit via a supply path.

5 52. The method of Claim 46 wherein the feed rate and the discharge rate are maintained at an approximately equal rate that is less than the circulation rate.

10 53. The method of Claim 46 wherein the dialysate is fed directly into the fluid circuit from the chamber.

54. The method of Claim 46 wherein the dialysate is continuously circulated along the fluid loop a number of times that is approximately equal to the feed rate divided by a difference between the circulation rate and the discharge rate.

15 55. The method of Claim 46 wherein the dialysate is continuously fed into, circulated within and drained from the fluid loop over a treatment period of about 8 hours or less.

20 56. The method of Claim 46 further comprising the step of cleaning the therapy fluid including the dialysate prior to recirculation into, through and out of the peritoneum of the patient along the fluid loop to remove at least a portion of solutes from the therapy fluid.

25 57. The method of Claim 46 further comprising the step of automatically controlling therapy fluid flow into and out of the fluid loop during treatment.

58. The method of Claim 46 wherein the fluid loop can be adjusted to accommodate for a variable increase in volume of the therapy fluid during treatment.

59. A method for reducing an amount of dialysate used during dialysis therapy, the method comprising the steps of:

coupling a fluid circuit in fluid communication to a catheter in a peritoneum of the patient thereby defining a fluid loop along which a therapy fluid is

5 capable of being circulated into, through and out of the peritoneum;

supplying a source of dialysate in an amount of about 25 liters or less to the fluid loop at a supply rate;

circulating the therapy fluid including the dialysate along the fluid loop at a circulation rate to remove a therapeutically effective amount of ultrafiltrate and

10 solutes from the patient;

draining the fluid loop of the therapy fluid at a discharge rate; and

causing the dialysate to circulate a plurality of times along the fluid loop prior to discharge.

15 60. The method of Claim 59 further comprising the step of increasing a volume capacity of the fluid loop to accommodate for an increase in therapy fluid volume.

20 61. The method of Claim 60 wherein the increase in fluid volume is due to removal of the ultrafiltrate from the patient.

62. The method of Claim 60 wherein the increase in fluid volume is due to one or more solutions added to the fluid loop which are capable of enhancing diffusive properties of the dialysate prior to recirculation into, through and out of the patient.

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63. The method of Claim 62 wherein the solutions include an osmotic agent solution selected from the group consisting of a 2.5% dextrose-based solution, a 3.5% dextrose-based solution, a 4.25% dextrose-based solution, a greater than 4.25% dextrose-based solution and combinations thereof.

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64. The method of Claim 59 further comprising the step of cleaning the therapy fluid including the dialysate prior to recirculation into, through and out of the patient to remove at least a portion of solutes from the therapy fluid.

5 65. The method of Claim 64 wherein a sorbent material selected from the group consisting of carbon, activated charcoal and combinations thereof is used to non-selectively remove the portion of solutes from the therapy fluid.